

LABTECH

LTX UNIQUE

AOX / EOX / POX / TX ANALYZER



Company profile at a glance

Established in 1991, 3 divisions, 100 employees

ISO 9001:2009

ANALYTICAL LABORATORIES

- Accredited in accordance with CSN EN ISO/IEC 17025
- 3 main locations in CZ
- 3rd largest chemical lab in CZ

R&D and MANUFACTURING

- Located in Telnice near Brno
- Total Organic Halogens Analysers – LTX Unique
- Material Testing Systems
- Helium Leak Detection Stations – LT HL

SALES AND SERVICE

- Located in Telnice facility
- Customers' support
- Seminars and Training



Key Milestones

- 1991 Date of Incorporation
- 1994 1st LABTECH AOX analyzer on the marker
- 2010 2nd generation of LTX analyzer
- 2019 LTX Unique – the latest generation of AOX analyzer



Organically bound halogens

Monitored parameters

AOX	Absorbable organohalogens (on activated carbon)
EOX	Extractable organohalogens (by a specified organic solvent)
POX	Purchable volatile organohalogens
TOX, TX	Total organohalogens, Total halogens

Determination of **AOX**, **EOX**, **POX** and **TOX** parameters

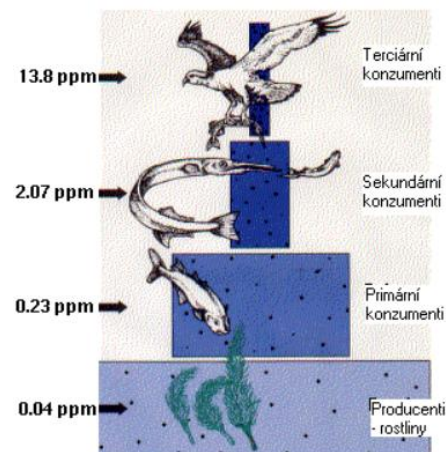
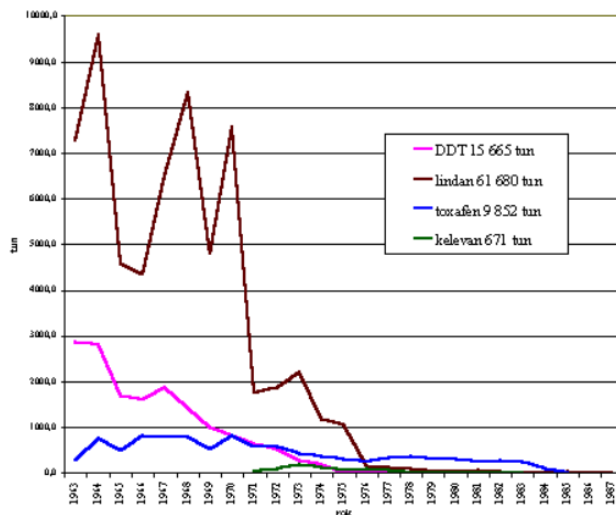
Environmental background

Organically bound halogens (OX) is a group of organic substances containing halogens (Cl, Br, I) in their molecule, most often chlorine. They are determined as a group parameter that characterizes pollution by substances of anthropogenic origin such as various herbicides (eg 2,4-dichlorophenoxyacetic acid, atrazine, trichloroacetic acid) and insecticides (DDT, lindane and others) used in agriculture, chlorinated bleaching waste cellulose, industrially used polychlorinated biphenyls or chlorinated solvents (perchlorethylene, chloroform,...).

Determination of **AOX**, **EOX**, **POX** and **TOX** parameters

Environmental background

Chemical and toxicological properties are always dependent on the type of compound. In general, however, these substances can be considered toxic to aquatic organisms, capable of bioaccumulation, with varying degrees of toxicity to humans.



Legislative background

Reasons for introduction into legislation:

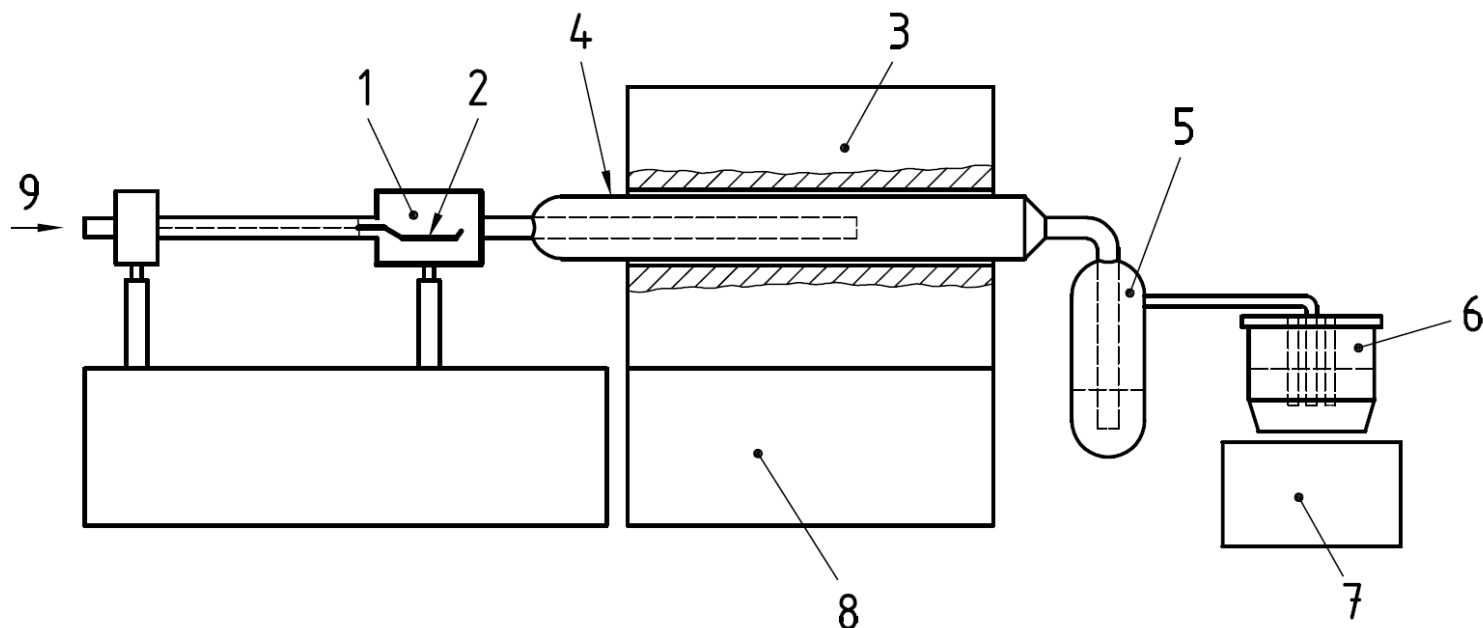
- Relatively simple and cheap method
- Sufficient sensitivity and accuracy of the determination
- Fast determination without the need for standards

Basic principle of AOX / TX determination

Sample
Introduction

Combustion

Detection



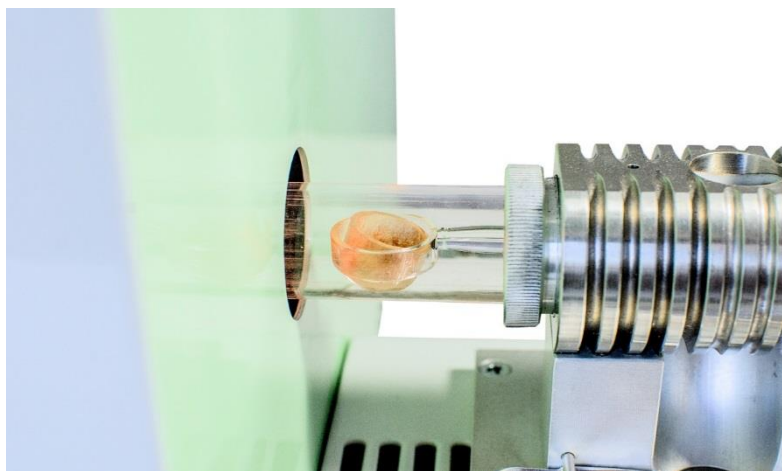
1 Sample Inlet
2 AOX sample on a boat
3 Furnace

4 Combustion tube
5 Absorber
6 Titration Cell

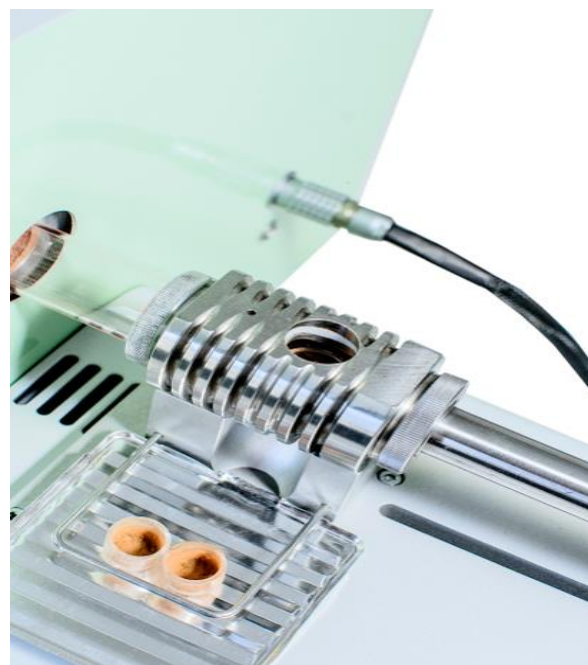
7 Stirrer
8 Temperature and gas flow setting
9 Carrier gas inlet

AOX – sample introduction

- AOX - 50 mg of activated coal with the sample after a pre-treatment
- TX - about 20 mg of rough sample



Intruduction of the AOX sample on the quartz boat or frits



Burned samples are automatically released

Pictures show the AOX module without autosampler

AOX – sample introduction

- AOX module with 8-position carousel autosampler



Standard AOX methods

Water

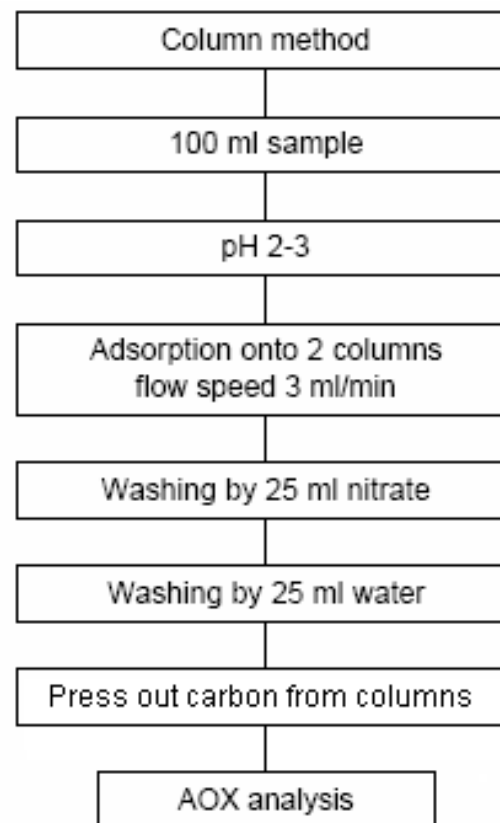
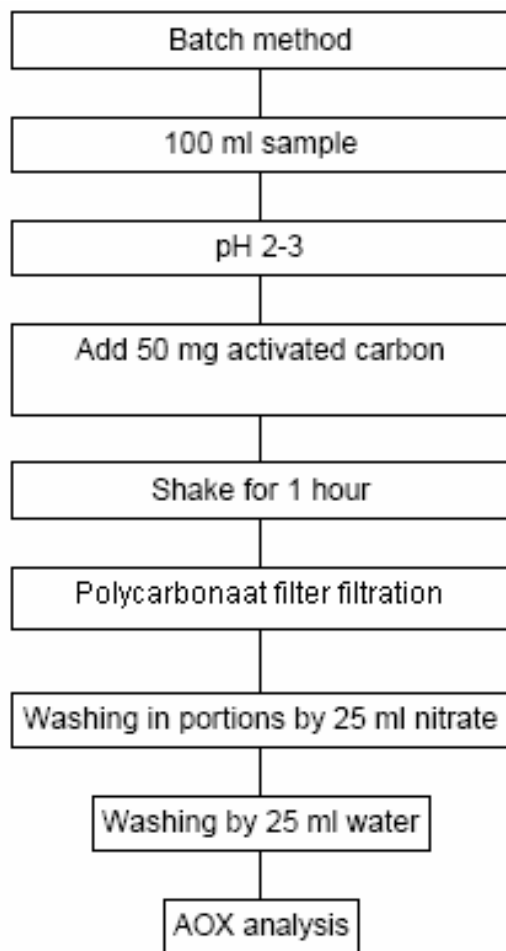
EN ISO 9562

EPA 9020

Sludge and sediments

DIN 38414 - S18

AOX sample preparation



AOX methods

Batch

Advantage:

- Simple method
- Lower operating cost
- AOX determination in water with particles (waste water)
- AOX determination in sludge and sediments

Disadvantage:

- Difficult filtration of samples containing fine particles

Column

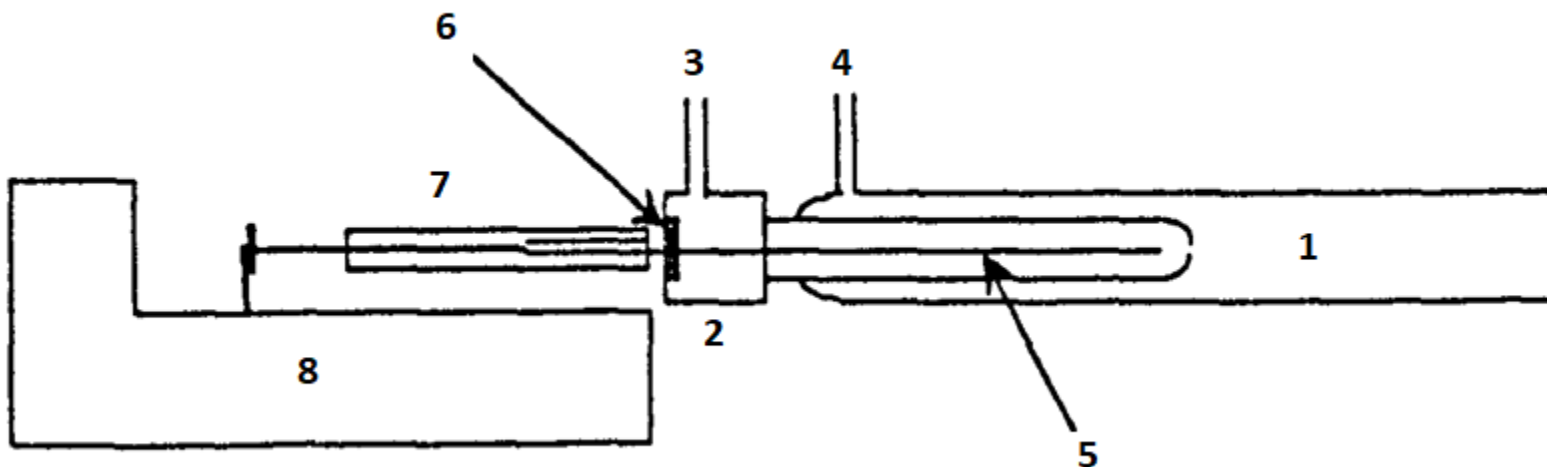
Advantage:

- Smaller lost of volatile halogenated organic compounds

Disadvantage:

- Higher operating cost (two times more analysis)

Introduction system of liquid EOX samples



1 Combustion tube
2 Chamber
3 Argon input

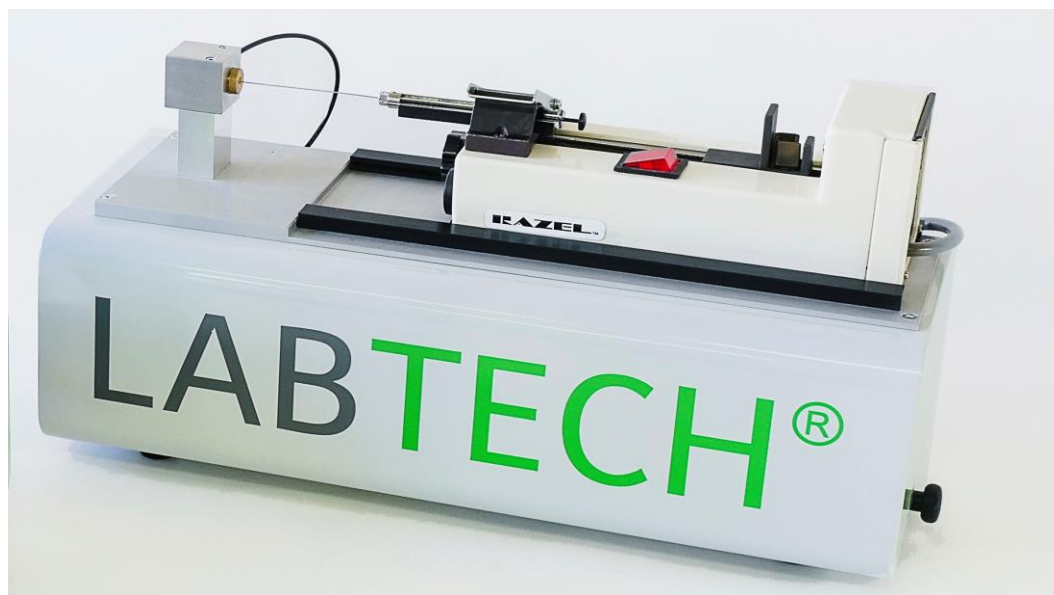
4 Oxygen input
5 Needle
6 Septum

7 Syringe
8 Linear pump

EOX – sample introduction of liquid samples

Injection by a syringe – a semi-automatic measurement

- EOX - 250 µl of residue solvent extract (hexan, ethyacetat, ...)
- TOX - 250 µl of solvents



EOX module with a syringe (semi-automatic version)

EOX – sample introduction of liquid samples

A fully automated measurement

- Injection by a peristaltic pump
- A sampling loop with a 6-way two-position valve
- Supplied with a third party XY autosampler
- Suitable for petrochemistry market
- *Currently under final testing and evaluation (to be launch at the end of 2020)*

Standard EOX methods

Water

Extraction by low polar solvent (hexane, petrol ether) at two different pH, putting together

Standards

DIN 38409 - H8

NEN 6402

NEN 6676

Solid

Extraction of dry sample by hexane

Extraction by ethyl acetate

Extraction of acetone suspense by hexane

Standards

DIN 38414 - S17

EPA 9023

NEN 5777

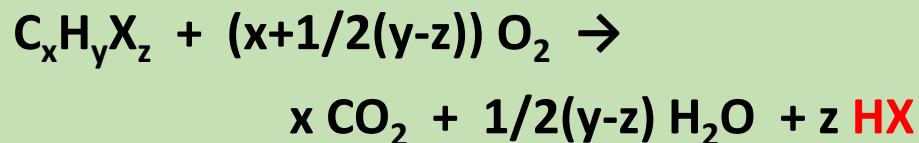
NEN 5735

Combustion Unit

Combustion in oxygen

AOX at 950°C

EOX at 850°C



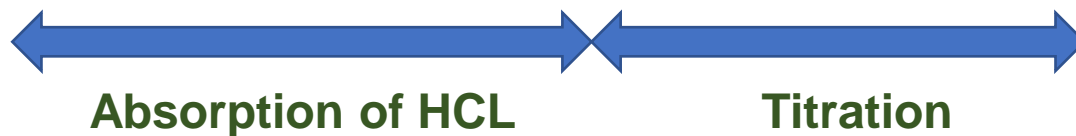
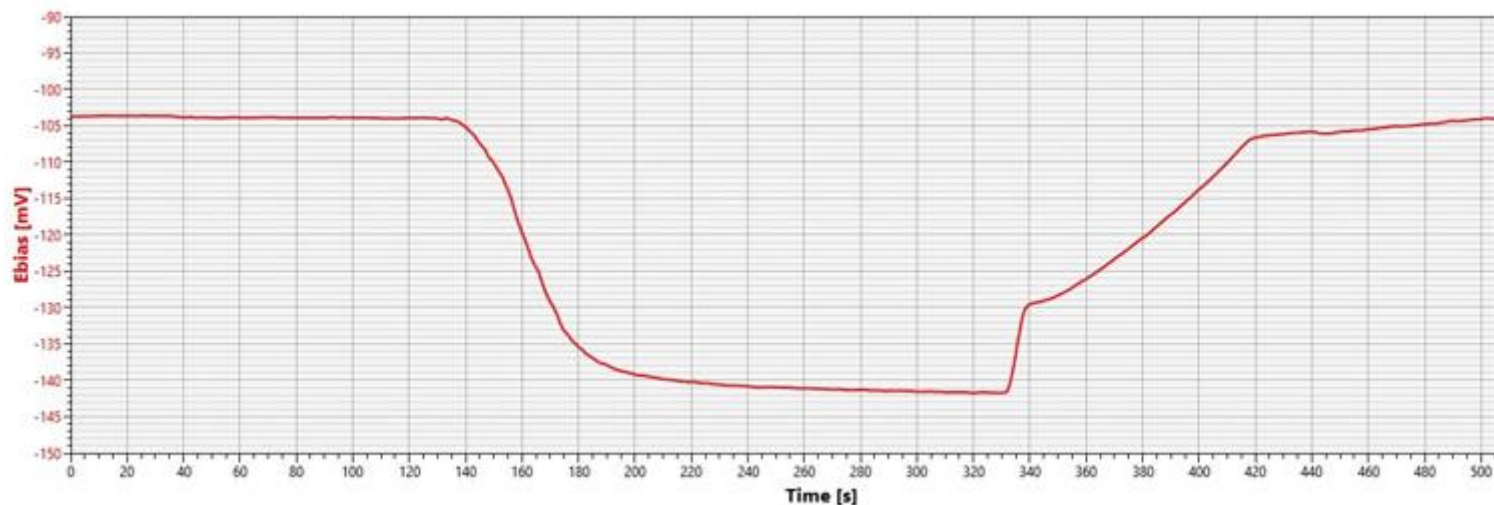
- ☐ Furnace max. 1200°C
- ☐ Adjustable temp range 700 – 1100°C by 1°C
- ☐ Specific design of quartz tubes either for AOX or EOX

Analysis

Combustion is completed before the system starts a titration.

On-line titration curve is shown on the display

This gives the operator a clear picture about behavior of the samples during determination of organic halogens.



Detection by microcoulometric titration

- Durable and easy-to-use titration cell designed by Labtech
- Wide dynamic range and high stability microcoulometer
- Robust electrodes with low and easy maintenance
- Suitable for a separate determination of halides



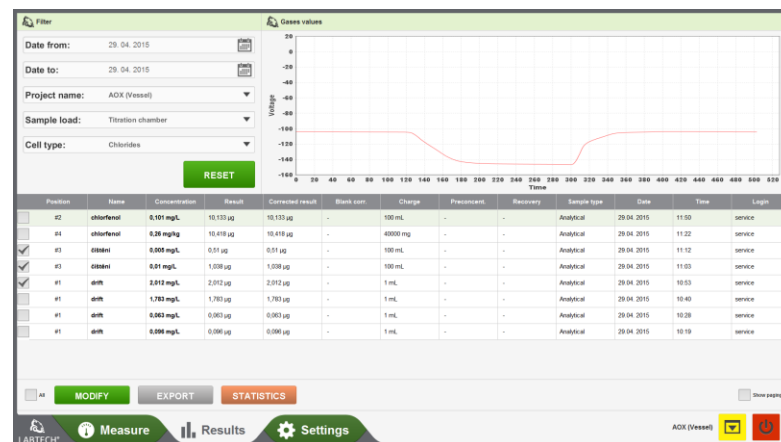
$$Q = \int I \cdot dt$$

$$1\mu\text{C} = 1,1 \text{ ng Ag}^+ = 0,83 \text{ ng Cl}^-$$



Software – Engine LT

- Specially designed to control and operate the instrument
- Windows 10 Operating System
- User-friendly – simple operation
- User's multi-level password protection
- Control of measurement and accessories
- Default standard methods
- Real time plot of combustion and titration curves
- Sample database system
- Data handling manager including data export (Excel)



LTX Unique – highlights and benefits

Flexible and modular design

- Fast exchange between AOX and EXO modules
- Easy access to the titration cell
- Robust and long-life electrodes
- Simple installation and easy operation

Fast and precise measurement

- Optimized combustion of samples in the furnace
- Titration starts after sample combustion with online display of the titration curve
- Automation ensures fast sample preparation and measurement
- Easy-to-use and intuitive software

Easy maintenance and low-cost operation

- Simple basic maintenance
- Fast delivery of spare parts and consumables
- Professional technical and analytical support

Technical specification of LTX Unique

Dimensions:	970x360x385 mm (length x width x height)	
Weight:	34 kg (except. PC)	
Power consumption:	Max. 1000W (6A); 230V/50Hz,	
Furnace temperature:	Max. 1100°C	
Total time of analysis:	Up to 6 min. (AOX,TX) and up to 12 min. (EOX)	
Gases:	Oxygen 99,6% (medical grade) (AOX,TX, EOX) Argon purity 99.996% (EOX)	
Software:	ENGINE LT ver.3.0, Windows 10	
Electrodes: TX TS	Ag - generation anode Pt - generation cathode Ag - indication Hg/Hg2SO4 reference	Pt - generation anode Pt - generation cathode Pt - indication Hg/Hg2SO4 reference
Measuring range:	0.02 – 300 µg Cl	
Precision:	better than 1.5% at 10 – 50 µg Cl	
Titration currents:	2000, 200, 20 and 2 µA	

References

More than 70 installations

- CZ, SK, SWE, China
 - Commercial contract labs
 - Local authorities
 - Chemical, pulp, paper and other industries
 - Universities
 - Water treatment



Public Health Institut OSTRAVA